An RFID-Enabled Sensor Interface for the EV Modular Instrumentation System

Completed Technology Project (2012 - 2013)

Project Introduction

Development of a passive radio-frequency identification (RFID) communication module, compliant with the EPCglobal class1, generation 2 air-interface standard, that can be interfaced easily with a variety of sensors via the EV Modular Instrumentation System (MIS). This capability will substantially increase the lifetime of a battery-powered MIS sensor node. The long-term goal is a small, completely passive RFID module with a plug-and- play, delay-tolerant network (DTN)-like sensor interface. A prototype design will be fabricated as an MIS hardware module and tested to determine power requirements, expected battery lifetimes, and preferred data acquisition and operational strategies for a variety of sensing modalities.

The goal of this project is development of a passive radio-frequency identification (RFID) communication module, compliant with the EPC global class1, generation 2 air-interface standard, that can be interfaced easily with arbitrary sensors via the EV Modular Instrumentation System (MIS) hardware. Since RFID communication operates entirely using power transmitted from an RFID interrogator, this will give MIS the capability to transmit sensor data "for free". Hence, the MIS power supply will be responsible only for data acquisition, which will substantially increase the lifetime of a battery-powered MIS node. For sufficiently low power sensors, it may be possible to power both communication and sensing using RF energy harvested from the interrogator (or through the addition of a second harvested source, such as solar). The RFID tags developed under this effort can be interrogated by any EPC global-compliant reader, such as the hand-held readers on ISS or future robotic free-flyers equipped with standard readers. Exploration vehicle structural monitoring (strain, vibration, etc.) and environmental monitoring (CO2, O2, etc.) are targeted as initial applications. The long-term goal is a small, completely passive RFID module with a plug-and-play, delay-tolerant network (DTN)-like sensor interface. The major goals accomplished under this project are: •A prototype open-source RFID communication module was designed, fabricated, and successfully tested by a senior design group at Rice University. •A COTS device with the desired functionality was identified, acquired, tested, and successfully interfaced with MIS hardware at JSC.

Anticipated Benefits

N/A

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Center Innovation Fund: JSC CIF

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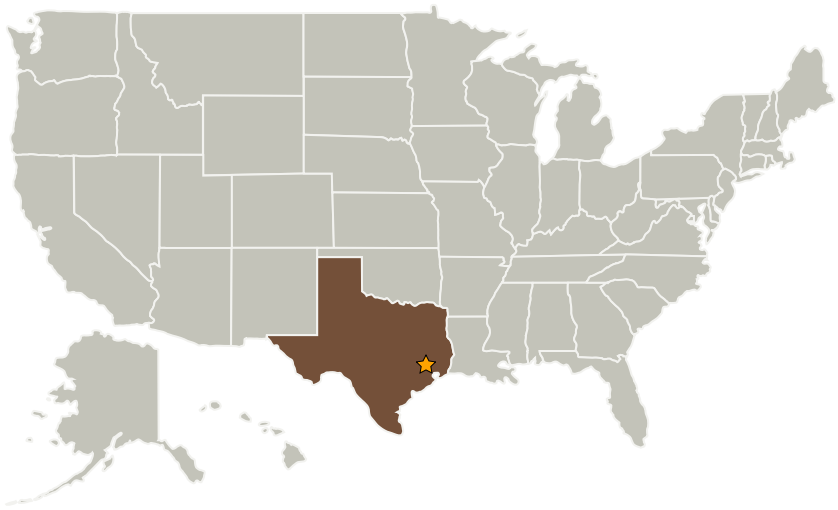
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations
Texas

Project Management

Program Director:
Michael R Lapointe

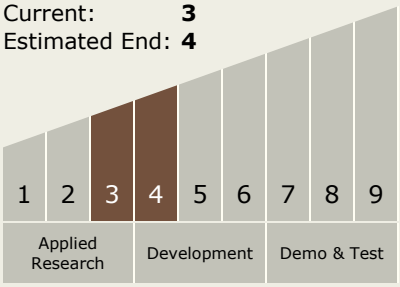
Program Manager:
Carlos H Westhelle

Project Manager:
Richard J Barton

Principal Investigator:
Richard J Barton

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **4**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.3 Human Health and Performance
    - TX06.3.4 Contact-less / Wearable Human Health and Performance Monitoring